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Attorney Docket No.: 14753
First-named Inventor: Clarke

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This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53 (c).

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TITLE OF THE INVENTION *(280 characters maximum)*

Container.

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Date **December 22, 2002**

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SPECIFICATION FOR PROVISIONAL APPLICATION FOR PATENT ENTITLED

CONTAINERS

Inventor

Raymond Clarke

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Title. Container

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BACKGROUND OF THE INVENTION

This invention relates to containers suitable for use in the packaging of respiring biological materials.

Respiring biological materials, e.g. fruits and vegetables, consume oxygen (O_2) and produce carbon dioxide (CO_2) at rates which depend upon the stage of their development, the atmosphere surrounding them and the temperature. In modified atmosphere packaging (MAP), the objective is to produce a desired atmosphere around respiring materials by placing them in a sealed container whose permeability to O_2 and CO_2 is correlated with (i) the partial pressures of O_2 and CO_2 in the air outside the package, and (ii) the temperature, to produce a desired atmosphere within the container. In many cases, the container includes an atmosphere control member having a high O_2 transmission rate (OTR) and CO_2 transmission rate (COTR). The abbreviation ACM is used herein for atmosphere control member. In controlled atmosphere packaging (CAP), the objective is to produce a desired atmosphere around respiring materials by displacing some or all of the air within a container by one or more gases, e.g. nitrogen, O_2, CO_2 and ethylene, in desired proportions. For further details of MAP and CAP, reference may be made, for example, to U.S. Patent Nos. 3,360,380 (Bedrosian), 3,450,542 (Badran), 3,450,544 (Badran et al.), 3,798,333 (Cummin et al), 3,924,010 (Erb), 4,003,728 (Rath), 4,734,324 (Hill), 4,779,524 (Wade), 4,830,863 (Jones), 4,842,875 (Anderson), 4,879,078 (Antoon), 4,910,032 (Antoon), 4,923,703 (Antoon), 4,987,745 (Harris), 5,041,290 (Wallace et al.) 5,045,331 (Antoon), 5,063,753

(Woodruff), 5,160,768 (Antoon), 5,254,354 (Stewart), 5,333,394 (Herdeman), 5,433,335 (Raudalus et al.), 5,460,841(Herdeman), 5,556,658 (Raudalus et al.), 5,658,607 (Herdeman), 5,807,630 (Christie et al.), 6,013,293 (De Moor), 6,190,710 (Nir et al), 6,210,724 (Clarke et al.), 6,376,032 (Clarke et al.) and 6,548,132 (Clarke et al.), copending commonly assigned US Patent Application Serial Nos. 09/121,082 (Clarke et al.), 09/580,379 (Clarke), 09/858,190 (Clarke), 09/989,682 (Clarke) and 60/435567 (Clarke et al.), US Patent Application Publication Number US 2002/0127305 (Clarke) International Publication Nos. WO 94/12040 (Fresh Western), WO 96/38495 (Landec), WO 00/04787 (Landec), WO 01/92118 (Landec) and WO 03/043447, and European Patent Applications Nos. 0,351,115 and 0,351,116 (Courtaulds). The disclosure of each of those patents, applications and publications is incorporated herein by reference for all purposes.

In some sealed packages, when the moisture content of the packaging atmosphere is too high, temperature fluctuations can cause moisture to condense on the inside of a transparent container, thus interfering with visual inspection of the contents of the package. U.S. Patent No. 6,190,710 (Nir et al.) discloses the use, as a packaging material for fruits and vegetables, of plastic packaging material having a thickness of up to about 500 micron and having a permeability to water vapor (MVTR) exceeding about 1.5 g mm

m^{-2} per day at 38°C and 85-90% relative humidity. The patent states that the use of such films "allows for minimal or no condensation on its surface when used to package produce" and provides "an environment for produce which comprises approximately 4-20% oxygen, 0.5-17% CO_2 and has a relative humidity of 85-100%". The composition of the plastic packaging material is stated to include "homopolymers or copolymers with chemical groups that are given to hydrogen bonding or association with water, for example homopolymers or copolymers containing amides, esters, anhydrides, or urethanes, or their derivatives, or containing acyl groups, carboxyl groups, or alcohol groups, or their derivatives". Preferred polymers are stated to include "a polyamide such as nylon-6 or nylon-66 or copolyamides such as nylon-6/66

or nylon-6/12". The patent states that, in order to increase the oxygen and carbon dioxide permeability of the film, the raw material of the film may be manipulated, or the polymeric film can be perforated; and that, in order to change the water vapor permeability of the film, the film can be subjected to heat, steam or orientation processes.

SUMMARY OF THE INVENTION

I have discovered that disadvantages associated with excessive moisture content in a package can be alleviated by using a container having an interior surface which is at least partly composed of a polymeric composition which, when immersed in water at 23°C, has an equilibrium water content, and/or a water content after 24 hours immersion, of at least 4.0%, preferably at least 6.0%, particularly at least 8%, by weight, based on the dry weight of the composition. Alternatively or additionally, the polymeric composition may, when exposed at 23°C to an atmosphere having a relative humidity of 50%, have an equilibrium water content of at least 1.0%, preferably at least 2.0%, particularly at least 2.4%, by weight, based on the dry weight of the composition. Such testing can if desired be carried out using, for example, a specimen in the form of a disc having a diameter of 2 in. and a thickness of 0.125 or 0.250 in., for example in accordance with ASTM D570. Polymeric compositions having water absorbency as defined above are referred to herein as "hydrophilic polymer compositions" or HPC's.

Many of the plastic packaging materials disclosed in U.S. Patent No. 6,190,710 (Nir et al.) are composed of HPC's as defined above, but I believe that their reported usefulness results from their ability to absorb moisture, rather than (or at least in addition to) their moisture vapor transmission capabilities. Furthermore, the MVTR of a composition, as defined by Nir et al., insofar as it is important at all, is not in itself a sufficient criterion for designing a package which will have, or tend to have, a desired level of humidity. This is because the moisture vapor transmission of a particular piece of film depends not only on the MVTR of the film material, but also on the thickness and

the area of the piece of film. The design criteria become more complex when the container also comprises other materials, either as separate parts of the container or as a layer or layers laminated to a film composed of a material having a particular MVTR. Still less is the MVTR, as defined by Nir et al., a sufficient criterion for designing a package which will have, or tend to have, desired levels of oxygen and carbon dioxide. Nir et al. state that modification of the polymeric material itself or its method manufacture, or perforation of the polymeric film, can be used to adjust the permeability of a film to moisture vapor and/or oxygen and/or carbon dioxide. However, the range of adjustment which can be obtained in this way is limited. Nylon-6, for example, has a very low OTR (less than 0.01 times the OTR of a polyolefin). Perforation of such films makes them more permeable. However, the perforations are equally permeable to oxygen and carbon dioxide (i.e. have a COTR/OTR ratio of 1), and as a result the sum of the oxygen and carbon dioxide contents of the packaging atmosphere is about 21%. For many materials, for example those for which the recommended packaging atmosphere is 2-5% oxygen and 5-10% carbon dioxide, this is unsatisfactory.

I have realized that HPC's can be used in the packaging of respiring biological materials in ways not disclosed or suggested by U.S. Patent No. 6,190,710 (Nir et al.)

In accordance with a first preferred aspect of the invention, a sealable container for packaging respiring biological materials (a) has an interior surface which is at least partially composed of an HPC, and (b) comprises at least one non-HPC polymeric component through which (after the container has been sealed around the respiring biological material) pass oxygen, carbon dioxide and moisture vapor entering or leaving the packaging atmosphere.

In one preferred embodiment of the invention, the HPC is in the form of a self-supporting HPC film, and the container further comprises a second polymeric component composed of a non-HPC polymeric material. Preferably at least 50%, particularly at least 80% or at least 90%, e.g. 95-99.9% of the oxygen entering the

packaging atmosphere of the sealed container passes through the second polymeric component. The second polymeric component is preferably an ACM, for example an ACM as disclosed in one of the documents incorporated herein by reference. Such ACM's have COTR/OTR ratios which are substantially higher layer the 1:1 ratio of perforations, for example to: one to 5:1, e.g. about 4:1. This has an important influence on the packaging atmosphere, and increasingly so as the permeability of the remainder of the container decreases. Such ACM's also have substantially higher ratios of ethylene permeability to oxygen permeability, for example 2:1 to 5:1, e.g. about 4:1, than do perforations, which are equally permeable to ethylene and oxygen. This is important in applications when the respiring biological material is to be ripened in the sealed container by exposure to ethylene. In this embodiment, the self-supporting HPC film can be, but is not necessarily, treated to modify its permeability to water vapor and/or oxygen and/or carbon dioxide, and can be, but preferably is not, perforated.

In a second embodiment of the invention, the HPC is in the form of the interior layer of a laminar member comprising multiple (including two) polymeric layers. Such a laminar member can provide part or all of the container and can be, but preferably is not, the only part of the container through which passes the oxygen, carbon dioxide and moisture vapor entering or leaving the packaging atmosphere. Such a laminar member can be, but preferably is not, perforated through all the layers, after the laminar member has been assembled. Optionally, one or more of the layers can be perforated before the laminar member is assembled. The perforations can be large perforations, so that the perforated layer contributes to the physical strength of the laminar member, but not to its gas transmission properties of the laminar member, which are determined by the layer or layers covering the large perforations. In the second embodiment of the invention, the container preferably includes a second polymeric component as described above in the first embodiment of the invention

The invention includes empty containers which (i) have an interior surface comprising an HPC, (ii) comprise a second polymeric component as described above,

preferably an ACM, and (iii) can be sealed around a respiring biological material; and sealed packages comprising such a container which has been sealed around a respiring biological material.

DETAILED DESCRIPTION OF THE INVENTION

In the Summary of the Invention above and in the Detailed Description of the Invention, and the Statements below, reference is made to particular features (including method steps) of the invention. It is to be understood that the disclosure of the invention in this specification includes all appropriate combinations of such particular features. For example, where a particular feature is disclosed in the context of a particular aspect or embodiment of the invention, or a particular Statement or claim, that feature can also be used, to the extent appropriate, in combination with and/or in the context of other particular aspects and embodiments of the invention, and in the invention generally.

In describing and claiming the invention below, the following abbreviations, definitions, and methods of measurement (in addition to those already given) are used.

OTR is O_2 permeability. COTR is CO_2 permeability. OTR and COTR values are given in cc/100 inch^2.atm.24 hrs, and can be measured using a permeability cell (supplied by Millipore) in which a mixture of O_2, CO_2 and helium is applied to the sample, using a pressure of 0.035 kg/cm^2 (0.5 psi), and the gases passing through the sample are analyzed for O_2 and CO_2 by a gas chromatograph. The cell could be placed in a water bath to control the temperature. The abbreviation P_{10} is used to mean the ratio of the permeability, to O_2 or CO_2 as specified, at a first temperature T_1°C to the permeability at a second temperature T_2, where T_2 is (T_1-10)°C. T_1 being 10 °C and T_2 being 0 °C unless otherwise noted. The abbreviation R or R ratio is used to mean the ratio of COTR to OTR, both permeabilities being measured at 20°C unless otherwise noted. Pore sizes are measured by mercury porosimetry. Parts and percentages are by

weight, except for percentages of gases, which are by volume. Temperatures are in degrees Centigrade. For crystalline polymers, the abbreviation T_o is used to mean the onset of melting, the abbreviation T_p is used to mean the crystalline melting point, and the abbreviation ΔH is used to mean the heat of fusion. T_o, T_p and ΔH are measured by means of a differential scanning calorimeter (DSC) at a rate of 10°C/minute and on the second heating cycle. T_o and T_p are measured in the conventional way well known to those skilled in the art. Thus T_p is the temperature at the peak of the DSC curve, and T_o is the temperature at the intersection of the baseline of the DSC peak and the onset line, the onset line being defined as the tangent to the steepest part of the DSC curve below T_p.

The term "comprises" and grammatical equivalents thereof are used herein to mean that other elements (i.e. components, ingredients, steps etc.) are optionally present. For example, a composition " comprising" (or "which comprises") ingredients A, B and C can contain only ingredients A, B and C, or can contain not only ingredients A, B and C but also one or more other ingredients. The term "consisting essentially of" and grammatical equivalents thereof is used herein to mean that other elements may be present which do not materially alter the invention. Where reference is made herein to a method comprising two or more defined steps, the defined steps can be carried out in any order or simultaneously (except where the context excludes that possibility), and the method can include one or more other steps which are carried out before any of the defined steps, between two of the defined steps, or after all the defined steps (except where the context excludes that possibility. The term "at least" followed by a number is used herein to denote the start of a range beginning with that number (which may be a range having an upper limit or no upper limit, depending on the variable being defined). For example "at least 1" means 1 or more than 1, and "at least 80%" means 80% or more than 80%. The term "at most" followed by a number is used herein to denote the end of a range ending with that number (which may be a range having 1 or 0 as its lower limit, or a range having no lower limit, depending upon the variable being defined). For example, "at most 4" means 4 or less than 4, and "at most 40%" means

40% or less than 40 %. When, in this specification, a range is given as " (a first number) to (a second number)" or "(a first number) - (a second number)", this means a range whose lower limit is the first number and whose upper limit is the second number. For example, "from 8 to 20 carbon atoms" or "8-20 carbon atoms" means a range whose lower limit is 8 carbon atoms, and whose upper limit is 20 carbon atoms. The numbers given herein should be construed with the latitude appropriate to their context and expression.

Where reference is made herein to sealed packages and sealed containers, and to sealing bags and other containers, it is to be understood that the sealing can be, but need not be, hermetic sealing. Conventional methods for sealing bags and other containers can conveniently be used in this invention. If the container is sealed hermetically, it will generally be desirable to include one or more pinholes in the container, to achieve equilibration of the pressures inside and outside the container, without substantially changing the permeability of the container as a whole to oxygen, carbon dioxide and water vapor.

Containers

The containers of the present invention can be of any shape or size appropriate to the materials to be packaged. Often, an important reason for using an HPC will be to ensure that the contents of the sealed package are fully visible, for example in a retail store. In those circumstances, the HPC will provide at least part of a transparent panel in the container. In some embodiments of the invention, the container is a simple bag composed of a flexible film consisting essentially of, or containing an interior layer of, a polymeric composition comprising an HPC, and having an ACM covering an aperture in the bag. In other embodiments, the container comprises a relatively rigid container base having a well in which the biological material is placed, and a top member which comprises an HPC and is sealed to the top of the base. The container base, which may for example be thermoformed, can be composed of a polymeric composition or

another material; the polymeric composition of the base can also comprise an HPC, or any other polymer whose permeability to oxygen, carbon dioxide and water vapor is appropriate to the desired packaging atmosphere. The top member can be a flexible film comprising the HPC, or a shaped member, for example a thermoformed member, comprising the HPC. Preferably, at least one of the container base and top includes an ACM covering an aperture therein.

When a container is composed of different parts, the container as a whole has permeabilities to oxygen, carbon dioxide and water vapor which depend upon the sum of the permeabilities of the different parts of the container (which in turn depend upon the OTR, COTR, MVTR, thickness and area of the different parts of the container). Therefore, when the HPC is in the form of a self-supporting film in accordance with the first embodiment of the present invention, its COTR, COTR and MVTR are factors in determining the packaging atmosphere within the sealed package; but they are not the only factors (and may not be significant factors at all), because there are other parts of the container through which at least one of oxygen, carbon dioxide and moisture vapor can enter or leave the packaging atmosphere. When the HPC is part of a multilayer laminar structure in accordance with the second embodiment of the invention, one or more of its OTR, COTR and MVTR may also be factors in determining the composition of the packaging atmosphere. Thus, depending on the relative OTR, COTR and MVTR values of the HPC and of the other layer(s), and the thicknesses of the different layers, the permeabilities of the multilayer laminar structure to oxygen, carbon dioxide and moisture vapor may be respectively dominated by only one of the layers.

HPCs

Where reference is made herein to HPC's, it is to be understood that this term is intended to include polymeric compositions which are HPC's as defined and which comprise a polymeric component composed of (i) a single HPC or (ii) a mixture of two or more polymers, one or more of the polymers being an HPC as defined; such

compositions can include, in addition to the polymeric component, conventional non-polymeric additives, e.g. fillers and stabilizers. The term also includes multi-layer laminates in which each of the layers is composed of an HPC.

Many HPC's have very low OTR and/all COTR values and relatively high MVTR values, for example an OTR less than 100 cc/m^2-day-atm, or less than 70 cc/m^2-day-atm, and/or a COTR value less than 300 cc/m^2-day-atm, or less than 250 cc/m^2-day-atm, and/or and MVTR of more than 1.5 g mm m^{-2} per day at 38°C and 85-90% relative humidity.

As noted above, when the HPC is used in the form of a self-supporting film in accordance with the first embodiment of the present invention, there must be at least one second polymeric component through which pass at least some of the oxygen and/or carbon dioxide and/or moisture vapor entering or leaving the packaging atmosphere. When the HPC is in the form of a layer of a multilayer laminar member in accordance with the second embodiment of the invention, it is likewise preferred that there is at least one such second polymeric component. In both embodiments, the second polymeric component is preferably at least one ACM, for example one of the many ACM's known to those skilled in the art and disclosed in the documents incorporated by reference herein, especially an ACM which comprises a microporous film having a polymeric coating thereon. Preferably the ACM(s) is such that at least 50%, often at least 75%, for example at least 95%, of the oxygen which enters the interior of the sealed package passes through the ACM(s).

The HPC can comprise a homopolymer or a copolymer comprising repeating units containing, in the backbone and/or in side chains, groups having an affinity for water. Such polymers include polyamides, including nylon-6, nylon-66, nylon-6/66 and nylon-6-12; cellulosic polymers; polyesters; polyurethanes; polyvinyl alcohol; polylactic acid; and polymers containing substantial proportions of functional groups such as amide, hydroxyl, carboxyl, acyl, anhydride, amino, monoalkyl amino and dialkyl amino

groups. The HPC can also comprise a polymer whose water absorbency results from (i) the presence of a filler which is water-absorbent by reason of its chemical and/or physical structure (e.g. starch, zeolites, and nanotechnology fillers), and/or (ii) suitable porosity. The surface of the HPC can optionally be treated to modify its surface tension so that moisture vapor condensed thereon forms a smooth film.

When the HPC is in the form of a self-supporting film, the film may for example have a thickness of 10 to 200 micron, preferably 15 to 30 micron. When the HPC is in the form of a layer in a multi--layer laminate, the layer may for example have a thickness of 3 to 30 micron. The other layer or layers in the laminate can be polymeric or non-polymeric, for example thin layers composed of tough polymeric materials which have relatively high MVTR values.

Biological Materials

The present invention can be used for packaging of all types of respiring biological materials, including fruits, vegetables, cut flowers and plants, including for example bananas and green beans. The amount of material within the container can vary widely. The amount may be, for example at least 0.5 lbs., e.g. at least 2 lbs., for example 0.5 to 10 lbs., e.g. 2 to 4 lbs. The amount can also be much larger, for example up to 50 lbs. or even more, e.g. up to 200 lbs. The invention is particularly valuable for packaging unripe bananas, which can then be ripened in the sealed container, and placed on retail sale in the sealed container.

ACM's

References herein to "the ACM" or "an ACM" are intended to include two or more ACM's on the same package. The principal function of the ACM's preferably used in this invention is to provide a means for obtaining a package having desired permeabilities to particular gases, in particular oxygen and carbon dioxide, and, in some

cases (for example when ripening fruits which are ripened by exposure to ethylene, particularly bananas) to ethylene. Thus the ACM will generally provide at least 50%, for example at least 80%, preferably at least 95%, e.g. 98-100%, of the total oxygen permeability and/or the total ethylene permeability of the package. The ACM can also make a small contribution, e.g. less than 10%, for example 3 to 8%, to the total permeability of the container to moisture vapor.

In the ACM's preferably used in the present invention, the microporous polymeric film, which serves as a support for the polymeric coating, comprises a network of interconnected pores such that gases can pass through the film. Preferably the pores have an average pore size of less than 0.24 micron. Other optional features of the microporous film include

(a) at least 70%, e.g. at least 90%, of the pores having a pore size of less than 0.24 micron;

(b) at least 80% of the pores have a pore size less than 0.15 micron;

(c) less than 20% of the pores have a pore size less than 0.014 micron;

(d) the pores constitute 35 to 80% by volume of the microporous film;

(e) the microporous film comprises a polymeric matrix comprising (i) an essentially linear ultrahigh molecular weight polyethylene having an intrinsic viscosity of at least 18 deciliters/g, or (ii) an essentially linear ultrahigh molecular weight polypropylene having an intrinsic viscosity of at least 6 deciliters/g, or (iii) a mixture of (i) and (ii);

(f) the microporous film contains 30 to 90% by weight, based on the weight of the film, of a finely divided particulate substantially insoluble filler, preferably a siliceous filler, which is distributed throughout the film;

(e) the microporous film is prepared by a process comprising

(A) preparing a uniform mixture comprising the polymeric matrix material in the form of a powder, the filler, and a processing oil;

(B) extruding the mixture as a continuous sheet;

(C) forwarding the continuous sheet, without drawing, to a pair of

heated calender rolls;

(D) passing the continuous sheet through the calender rolls to form a sheet of lesser thickness;

(E) passing the sheet from step (D) to a first extraction zone in which the processing oil is substantially removed by extraction with an organic extraction liquid which is a good solvent for the processing oil, a poor solvent for the polymeric matrix material, and more volatile than the processing oil;

(F) passing the sheet from step (E) to a second extraction zone in which the organic extraction liquid is substantially removed by steam or water or both; and

(G) passing the sheet from step (F) through a forced air dryer to remove a residual water and organic extraction liquid.

Suitable microporous films are available under the tradename Teslin.

As indicated above, the polymeric matrix of the coating on the microporous film preferably comprises, and may consist of, a crystalline polymer, preferably an SCC polymer. The use of a crystalline polymer results in an increase in the P_{10} values in the melting region of the polymer. The SCC polymer can comprise, and optionally can consist of, units derived from (i) at least one n-alkyl acrylate or methacrylate (or equivalent monomer, for example an amide) in which the n-alkyl group contains at least 12 carbon atoms, e.g. 12-50 carbon atoms, for example in amount 35-100%, preferably 50-100%, often 80-100%, and optionally (ii) one or more comonomers selected from acrylic acid, methacrylic acid, and esters of acrylic or methacrylic acid in which the esterifying group contains less than 10 carbon atoms. The SCC polymer can also include units derived from a diacrylate or other crosslinking monomer. The preferred number of carbon atoms in the alkyl group of the units derived from (i) depends upon the desired melting point of the polymer. For the packaging of biological materials, it is often preferred to use a polymer having a relatively low melting point, for example a polymer in which at least a majority of the alkyl groups in the units are derived from (i) and contain 12 and/or 14 carbon atoms. The SCC polymer can be a

block copolymer in which one of blocks is a crystalline polymer as defined and the other block(s) is crystalline or amorphous, for example a block copolymer comprising (i) polysiloxane polymeric blocks, and (ii) crystalline polymeric blocks having a T_p of -5 to 40°C. SCC polymers can be prepared by solution polymerization or by emulsion polymerization, e.g. as disclosed in U.S. Patent Nos. 6,199,318 and 6,540,984 (Stewart et al) the entire disclosures of which are incorporated herein by reference.

The polymeric matrix can also consist of or contain other crystalline and amorphous polymers. Examples of such other polymers include cis-polybutadiene, poly (4-methylpentene), polysiloxanes including polydimethyl siloxane, and ethylene-propylene rubber.

The permeability of the containers and packages of the invention can be influenced by perforating the container in order to make a plurality of pinholes therein.

EXAMPLE

Bananas were packaged in (A) bags composed of a self-supporting film of biaxially oriented nylon-6 having a thickness of about 0.6 mil, and an ACM as described below, and (B) bags composed of a self-supporting film of polyethylene having a thickness of about 2 mils and the same ACM. Each of the bags was about 12 in. by 20 in.; had an aperture therein which had an open area about 1.76 in.^{2} and was covered by an ACM comprising a microporous film having a coating thereon of an SCC/polysiloxane block copolymer as disclosed in Example A7 of U.S. Patent No. 6,548,132; and was filled with about 3 lbs. of unripened bananas before being sealed. After three days, the sealed bags were exposed to ethylene in a ripening room. After the exposure to ethylene, the sealed bags were maintained at 58°F for 5 days, after which they were stored at 70°F. Condensation in the bags; pulp temperature and appearance of the bananas; and packaging atmosphere, were monitored over a period

of 13 days. There was substantially no condensation in the nylon-6 bags, and as a result the bananas could be viewed clearly throughout the test. The same was not true of the polyethylene bags. The pulp temperature of the bananas in the nylon-6 bags reached a peak of about 72.5 °F, whereas the pulp temperature of the bananas in the polyethylene bags reached a peak of about 75.5°F, and, after the eighth day, remained above 74°F. As a result, the bananas in the nylon-6 bags were of superior quality.

Claim

A sealed nylon-6 bag containing bananas substantially as described in the Example.

ABSTRACT

Biological materials can be stored in a container having an interior surface composed of a hydrophilic polymer composition.